

Maine Department of Transportation

Utility Reference



Guide

Maine Department of Transportation

Utility Reference Guide

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Introduction & Purpose

The Utility Reference Guide (URG) was initiated based on a request made by MaineDOT Utility Coordinators. The purpose of the guide is to provide relevant technical information about Maine utility systems as great efforts are required to coordinate utilities with MaineDOT bridge and highway projects. This reference material should assist Coordinators and others to communicate, identify and better understand the utility systems that provide services to the people of Maine.

It is anticipated that the URG will be continuously developed with input of Utility Coordinators as requirements for additional utility reference information arises.

UTILITY REFERENCE GUIDE

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UTILITY REFERENCE GUIDE

The Maine Electric Transmission & Distribution System

Section 1

Transmission System

The transmission system is responsible for carrying bulk electricity from generator plants such as illustrated in Figure 1, and ties to the rest of New England and Canada.

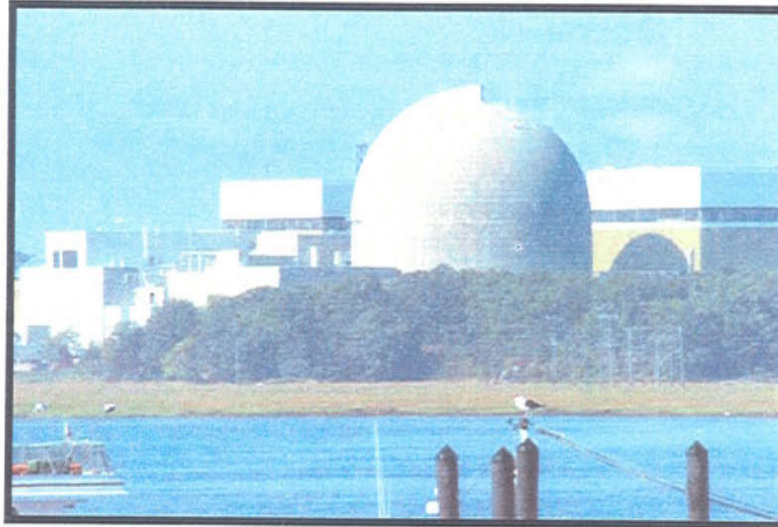


Figure 1

Seabrook Station, New Hampshire, Owned by Florida Power & Light

The transmission system consists of the highest capacity power lines and other high voltage equipment used for transmitting, switching, and controlling electrical power. The transmission system operates at various levels. For example, three major transmission voltage levels in Maine are 345 kV, 115 kV, and 34.5 kV. For illustration, the following is a breakdown of the three major transmission operating voltages and their characteristics.

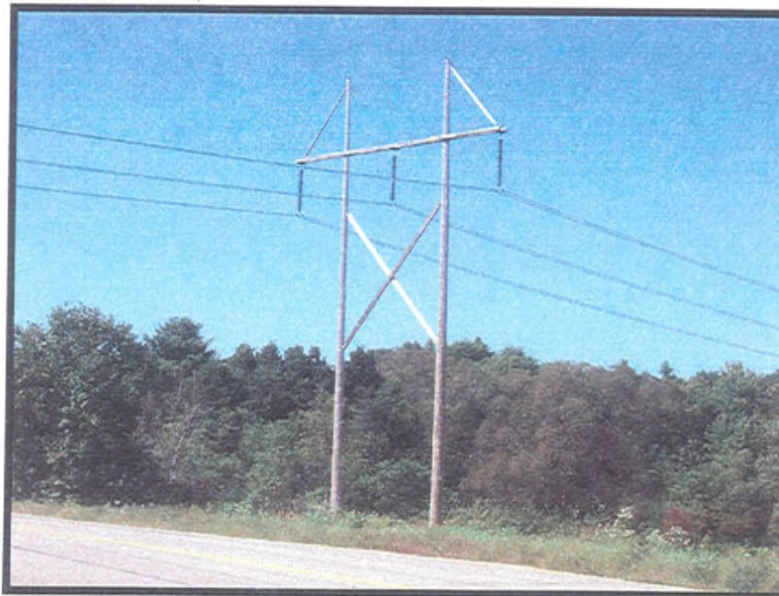


Figure 2

345 kV Structure near Maxcy's Substation in Windsor

The 345 kV system is the backbone of the transmission system, shown in Figure 2. The 345 kV transmission lines carry more power than any other lines in the entire system. They are the main connection between utilities and bulk power systems to the north, in New Brunswick, Canada, and to the south, in New Hampshire and Massachusetts. 345 kV transmission lines are responsible for delivering electricity from New Brunswick to the rest of the New England Power Pool (NEPOOL). The 345 kV substations in Maine include, from north to south, Orrington, Maxcys, Maine Yankee, Mason, Surowiec, Buxton, South Gorham, and W. F. Wyman. One former large generation plant W. F. Wyman (oil), is connected through the 345 kV system also. By operating transmission lines at such a high voltage, line losses and voltage drops can be minimized while the lines deliver large amounts of energy to customers.

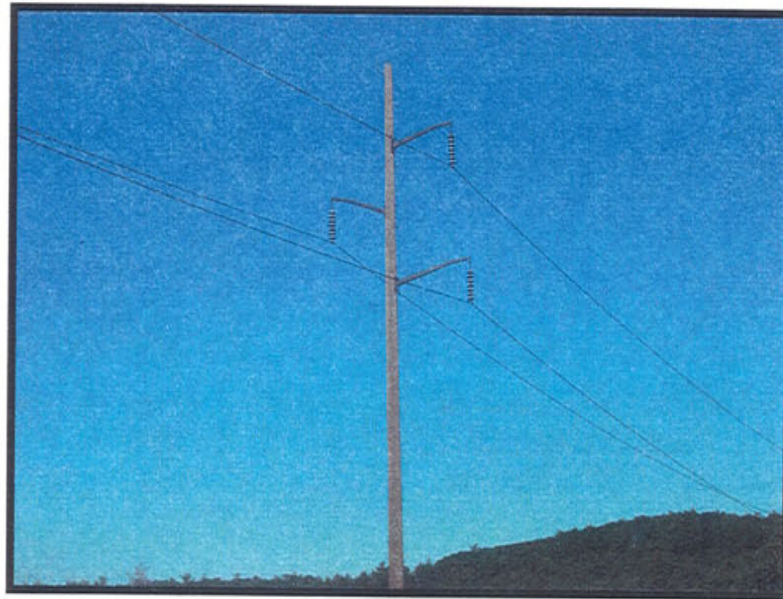


Figure 3

115 kV Structure near Maxcy's Substation in Windsor

The 115 kV system, Figure 3, is the workhorse of the transmission system. It is responsible for transmitting power from the 345 kV autotransformers and intermediate sized generation throughout the entire state. 115 kV transmission lines are the main arteries for electricity, carrying it to and from every geographical area. Many large industrial customers are served directly from the 115 kV transmission system. Central Maine Power Company, the largest electric utility in Maine, currently operates over one thousand miles of 115 kV transmission lines, connecting over 60 substations. There are also five 115 kV lines which connect CMP to neighboring utilities to the north (Bangor Hydro Electric Company) and south (Public Service Company of New Hampshire).

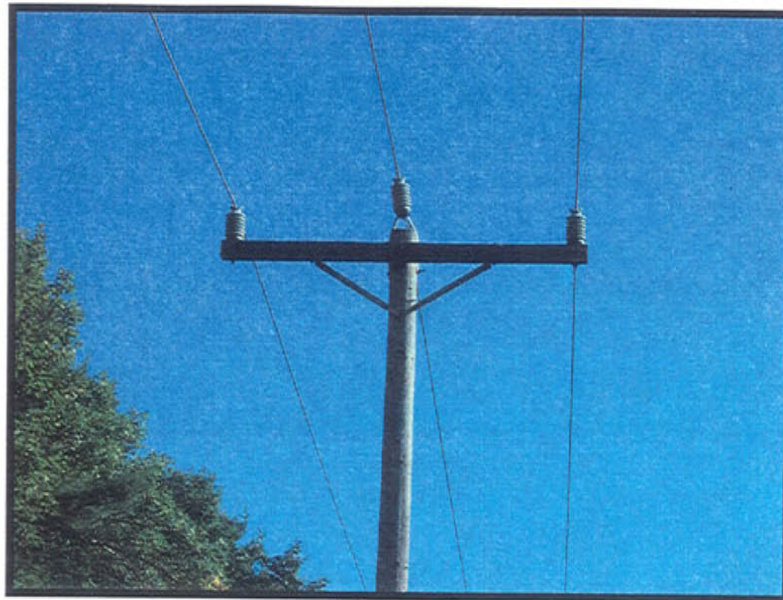


Figure 4

34.5 kV Structure in Vassalboro

The 34.5 kV system, Figure 4, transmits power to the distribution substations Figure 5 throughout the power system. These lines also provide connection to some of the more remote locations within the state. Many of the intermediate industrial and larger commercial customers are fed from the 34.5 kV system. These lines also provide access to many of the smaller hydroelectric generators owned by utilities, as well as to non utility generators (NUGs).

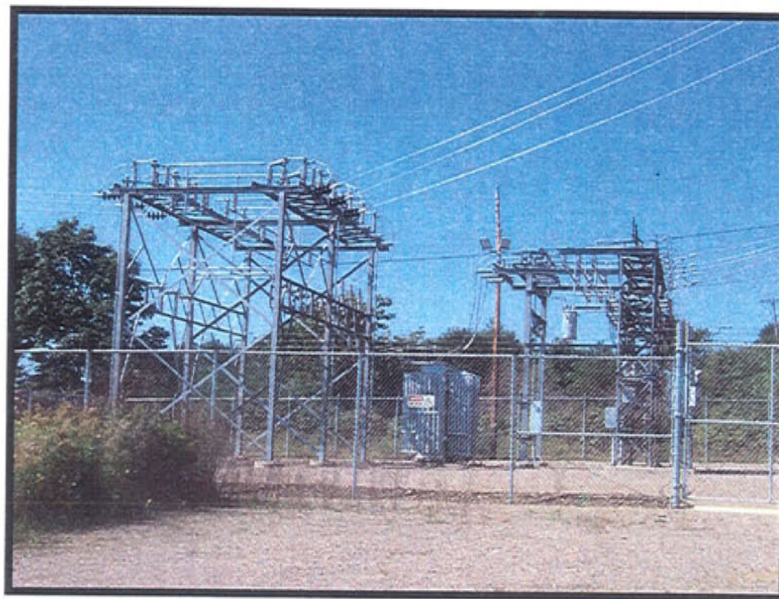


Figure 5

34.5 kV to 12 kV Substation in Sidney

Distribution System

The distribution system is responsible for carrying electricity from substations to the electric utility customers. The most common operating voltage for the distribution system is 12 kV. However, 4 kV and 34.5 kV distribution circuits are used in some locations.

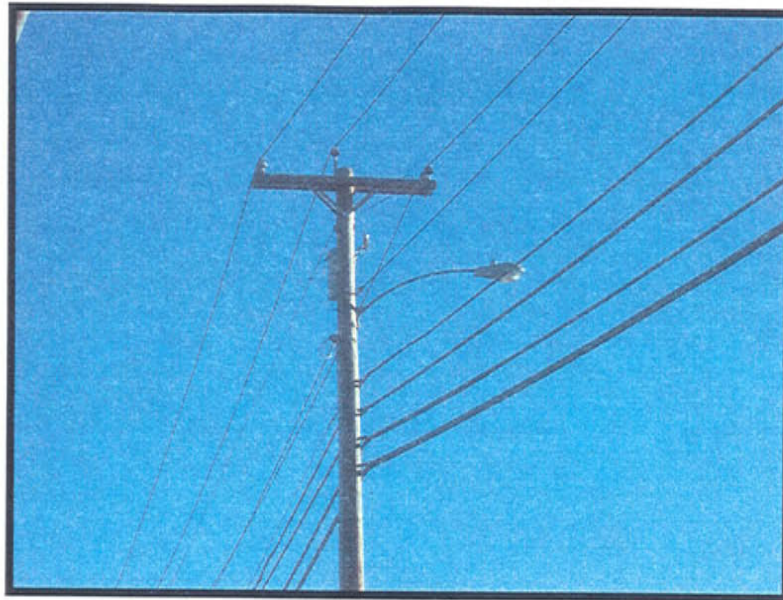


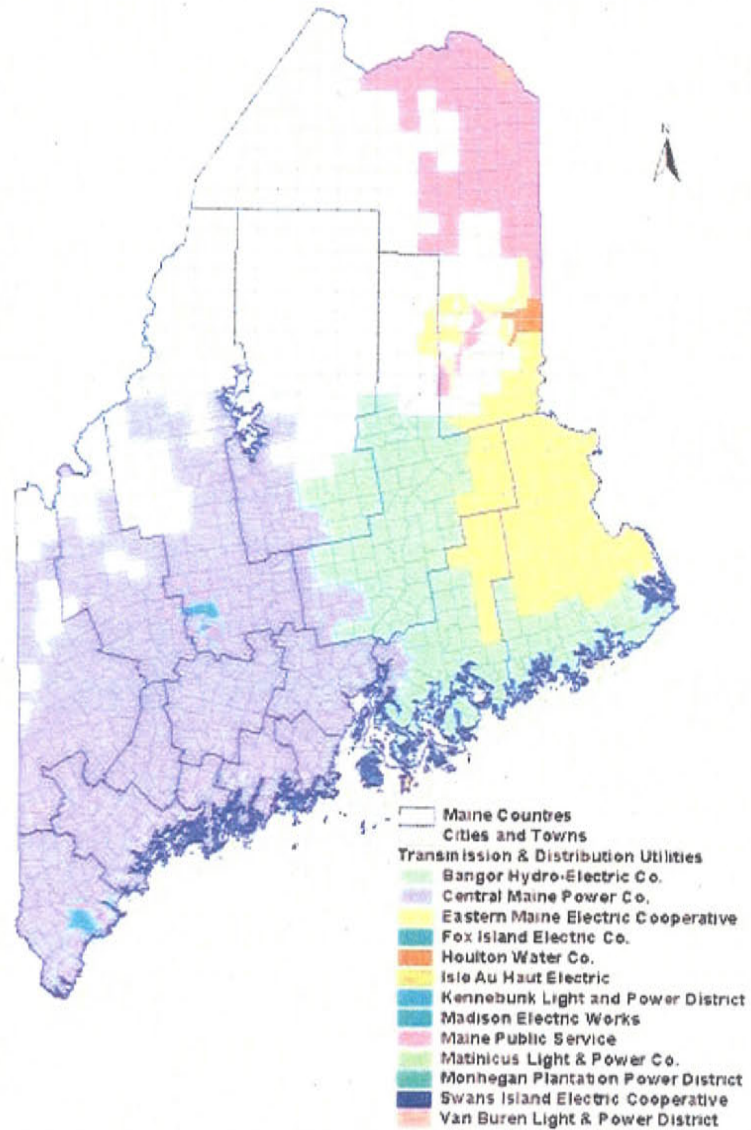
Figure 6

Typical 12 kV utility pole with communication lines shown, Augusta

Distribution circuits are most commonly found along the side of the road. The energized, or "hot", wires are found at the top of the pole on horizontal crossarms, or on a pole-top insulator. The neutral wire is typically attached to the pole about four feet below the crossarm. In most cases, telephone and cable television wires are attached further down the pole, Figure 6.

A regional map of all the electric utilities throughout Maine follows.

Maine Transmission & Distribution Utilities



UTILITY REFERENCE GUIDE

Electric Utility General Definitions

Below are common terms Maine DOT Utility Coordinators may come in contact with in dealing with electrical utility personnel. It is important to understand and utilize such terms as communication is an important aspect of utility coordination. Slang or generic terminology is identified in parenthesis.

34kV Transmission Structure: A structure used to support the electrical utility high voltage lines with the high importance of minor regions across the state. (PAGE 1-29).

115kV Transmission Structure: A structure used to support the electrical utility high voltage lines with the extreme importance of major regions across the state. (PAGE 1-28).

345kV Transmission "H" Structure: A structure used to support the electrical utility extra-high voltage lines (EHV) with the most importance to the national power grid system. (PAGE 1-28).

Alley Arm: A support arm that allows the electrical conductors to become cantilevered over the road way or "alley" to gain additional electrical clearance from objects such as buildings. (PAGE 1-17).

Alternating Current (AC): Electric current in which the direction of flow is reversed at frequent intervals: usually 100 or 120 times per second.

Amp: The unit for the electric current; the flow of electrons. One amp is 1 coulomb passing in one second. One amp is produced by an electric force of 1 volt acting across a resistance of 1 ohm. The typical amount of current in an electrical utility system can range as high as 4,000 Amps.

Bare Conductor: A conductor not covered with insulating material.

Breaker: An electrical device used to switch circuits and equipment in and out of a system in a substation.

Bushing: An insulating structure, including a through conductor or providing a passageway for such a conductor, with provision for mounting on a barrier, conducting or otherwise, for the purposes of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

Cable: A wire or bundle of wires which is a fully insulated conductor installed underground or aerial used to carry current.

Capacitors (Cap): An electrical device installed to improve the efficiency of the flow of electricity through distribution lines by reducing energy losses and typically installed to correct undesirable conditions in an electrical system. (PAGE 1-19).

Capacity: The maximum electrical load which equipment or a conductor can carry without breaking down.

UTILITY REFERENCE GUIDE
Electric Utility General Definitions

Circuit: A conductor or system of conductors through which an electric current is intended to flow.

Clearance: Authorization to perform specified work or permission to enter a restricted area.

Conductor: An object intended to carry electrical current such as a wire, cable, bus bar, rod, or tube can serve as a path for electricity to flow.

Conduit: A metallic or PVC pipe used for protecting wires typically on riser poles or in underground situations. **(PAGE 1-18).**

Continuity: The state of being whole, unbroken.

Cross Arm: A support arm that allows the electrical conductors to be support at the top of the utility pole commonly used in three phase electrical systems.

De-energized (Dead): Free from any electrical connection to a source of potential difference and from electric charge.

Direct current (DC): Electric current in which electrons flow in one direction only.

Distribution Line: An electrical line or system for distributing power from a transmission system to a customer. It is any line typically operating between 4,000 to 34,500 volts. **(PAGE 1-4).**

Distribution Transformer (Pot, Kettle, Can): Electrical devices that reduce the voltage of the primary circuit to the voltage required by customers. **(PAGE 1-22, 1-23).**

Duct Bank: A major conduit system run commonly encased in concrete that connects electrical manholes in underground distribution systems. **(PAGE 1-26).**

Electric System: All of the elements needed to distribute electrical power which includes overhead and underground lines, poles, transformers, and other equipment.

Electric Utility: An organization responsible for the installation, operation, or maintenance of an electric supply system.

Electricity (Juice): A form of energy produced by power plants.

Entrance Cable: The cable running down the side of a customer's house into the meter. This cable is owned by the customer and its maintenance is the customer's responsibility. Work on this cable should only be performed by a licensed electrician.

Energized (Live, Hot): Electrically connected to a source of potential difference.

UTILITY REFERENCE GUIDE
Electric Utility General Definitions

Face of Pole: The concave side of greatest curvature with sweep in one plane and one direction, or the side with greatest curvature between ground line and top of a pole having reverse or double sweep. The identity tag, brand or sight gain is always placed on the face of the pole and is typically the side of the utility pole that faces the highway.

Feeder: An electrical supply line, either overhead or underground, which runs from the substation, through various paths, ending with the transformers.

Field Side of Pole: The side of the pole that faces the field side, opposite of the face.

Fixture (Street Light): A complete lighting unit including one or more lamps with a connection to a power source. (PAGE 1-23).

Framing: To alter a utility pole typically by drilling equipment mounting hole or installing mounting devices to the pole.

Fused Cutout: A one time operating device that protects the distribution line from an electrical overload. It acts by melting during circuit overload or faulty conditions, breaking the circuit. (PAGE 1-24).

Generate: To produce electricity.

Generating Station (Power Plant): A facility where electricity is created. (PAGE 1-1).

Ground: A large conducting body (such as the earth) used as a common return for an electric circuit and as an arbitrary zero of potential.

Guy Wire: A steel stranded wire used to mechanically support a pole. (PAGE 1-19).

Handhole: An underground box made of fiberglass, plastic or concrete utilized to access underground electrical system components. (PAGE 1-26).

Hendrix: An electric utility owned line that carries heavy electrical loads capable of meeting the electrical requirements of commercial and industrial customers which typically consists of three primary conductors, one neutral conductor and a support wire. Hendrix is used by utilities because it offers greater protection against contact with tree limbs and small animals while maintaining a more consolidated configuration which gives the utility the option to put multiple circuits on the same structure. (PAGE 1-16).

Insulator (Glass): A device through which electricity cannot easily pass. An example would be porcelain support used to insulate conductors from a pole or tower. An insulator can be constructed of material such as porcelain, glass or rubber.

Kilovolt (kV): 1 kilovolt (kV) = 1,000 volts.

Kilowatt (kW): 1 kilowatt (kW) = 1,000 watts.

UTILITY REFERENCE GUIDE

Electric Utility General Definitions

Lightning Arrestor (Surge Arrestor): Protects lines, transformers, and equipment from lightning surges by carrying the charge to the ground.

Line: A system of poles, conduits, wires, cables, transformers, fixtures, and accessory equipment used for the distribution of electricity to the public.

Line Crews: A team of highly trained workers who service and repair lines and equipment.

Load: The amount of power delivered, as required, at any point or points in the system. A load is created by the power demands of customer equipment.

Manhole: A concrete containment with a steel cover installed below grade that contains underground electrical distribution system cables.

Megawatt: One million watts or 1,000 kilowatts.

Meter Enclosure: A device installed to measure the electrical power utilized by a customer. (PAGE 1-25).

Neutral: A "live" wire utilized to carry the unused electrical load in the electrical system. (PAGE 1-17).

Open Circuit: When a circuit opens, either switched off intentionally or as the result of a faulty circuit.

Overload: The flow of electricity into conductors or devices when normal load exceeds capacity.

Padmount Transformer (Pad): An electrical distribution device installed to change voltage levels in efforts to facilitate the transfer of power from the generating plant to the customer. (PAGE 1-25)

Phase: One of the characteristics of the electric service supplied or the equipment used. Practically all residential customers have single-phase service. Large commercial and industrial customers have either two-phase or three-phase service.

Planned Electric Outage: An interruption of service to electric lines to permit work that cannot be performed while the lines are energized.

Pole Class: The reference to the size or dimension of a pole. Class size is determined by the circumference of the pole at its tip and at 6 feet from the butt.

Pole Guy: A steel wire system configuration used to structurally support a pole or pole line which consist of a guy wire, guy guard and anchor. (PAGE 1-19)

Power: The time rate of using electric energy, usually expressed in kilowatt-hours.

UTILITY REFERENCE GUIDE
Electric Utility General Definitions

Power Plant: A generating station, a place where electricity is produced.

Power Transformers: Transformers raise or lower the voltage as needed to serve the transmission or distribution circuits.

Primary Distribution Feeder: Distribution lines that carry the highest distribution of voltage. They are usually located at the topmost position of the utility pole.

Primary Circuit (Primaries): The distribution circuits that carry power from substations to local load areas. They are also called express feeders or distribution main feeders. The distribution feeder bay routes power from the substation to the distribution primary feeder circuits. The primary circuits range from 4,000 to 69,000 volts in Maine. **(PAGE 1-17)**

Primary Conductors (Primaries): The higher voltage electrical lines that are used to distribute the electrical load throughout the power grid. These wires are physically attached to poles but electrically insulated from the pole by means of several types of insulators. **(PAGE 1-17).**

Push Brace (Push Pole): A pole installed at a specific angle to structurally support a main pole line. **(PAGE 1-18).**

Qualified Worker: One knowledgeable and specifically trained in the construction and operation of the electric power generation, transmission, and distribution equipment involved, along with the associated hazards.

Reclosure: An electrical device installed to react to a short circuit by interrupting electrical flow and then automatically reconnects the circuit after the electrical fault has potentially cleared. **(PAGE 1-20).**

Regulator: An electrical device installed to regulate and monitor the system voltage on an electrical line. **(PAGE 1-21).**

Riser: A pole which specifically provides for an electric service from an aerial electric system to an underground system. It contains conduit from the ground up the pole where it connects to the overhead lines. **(PAGE 1-18).**

Secondary Circuit: The distribution circuit on the low voltage side of a transformer (usually 120/240 volts).

Sectionalizer: A sectionalizer is similar to a reclosure, but only opens when a line is "dead" due to the operations of a reclosure or breaker upstream. It serves to isolate the section in fault and allow the remainder of the circuit to remain energized.

Service Area: A territory in which a utility is required or has the right to supply electric service to ultimate customers.

UTILITY REFERENCE GUIDE
Electric Utility General Definitions

Service Drop (Secondaries): are the lower voltage lines which contain the conductors that connect the customers to the primary line through a transformer. The service drop may contain three or four conductors depending on the electrical service needed. **(PAGE 1-17).**

Short Circuit: An accidentally established connection between two points in an electric circuit such as when a tree limb or an animal bridge the gap between two conductors. This will cause an overload of current on the line causing melting of lines, blown fuses, and the faulty operation of protective devices such as reclosures and circuit breakers.

Single Phase: An electric utility owned line that carries electrical loads capable of meeting the electrical requirements of residential customers, small commercial customers, and streetlights which consist of one primary conductor and one neutral conductor. **(PAGE 1-15).**

Static Line: A wire installed above high voltage transmission lines that are primarily used for redirect and dissipate lightning strikes away from the transmission electrical system. **(PAGE 1-28).**

Substation (Station): A facility containing switches, transformers, and other equipment and structures for adjusting voltage, monitoring circuits and other service functions. **(PAGE 1-3).**

Switch: An electro-mechanical device of several types and styles installed and manually or mechanically operated to physically and electrically disconnect, bypass or redirect electric current in an electrical circuit. Distribution systems have switches installed at strategic locations to redirect power flows for load balancing or sectionalizing. **(PAGE 1-21).**

Switching Station: A type of substation where connections are made between several distribution and transmission lines and voltage is not changed.

Tap: A terminal where an electric connection is established.

Three Phase: An electric utility owned line that carries heavy electrical loads capable of meeting the electrical requirements of commercial and industrial customers which typically consists of three primary conductors and one neutral conductor. **(PAGE 1-16).**

Transformer: An electrical device commonly installed to change voltage levels in efforts to facilitate the transfer of power from the generating plant to the customer. **(PAGE 1-22).**

Transformer Vault: A transformer vault is an underground structure or room in which power transformers, network protectors, voltage regulators, circuit breakers, meters, etc. are housed.

Transmission Lines (High Tension Lines): Are heavy wires that carry large amounts of electricity over long distances from a generating station to places where electricity is needed. Transmission lines are held high above the ground on tall towers called transmission towers. Commonly referred to as "High Tension Lines" or "High Voltage Lines". **(PAGE 1-28, 1-29).**

UTILITY REFERENCE GUIDE
Electric Utility General Definitions

Tree Crews: Are teams of employees or vendors who clear trees, limbs and brush from transmission and distribution lines.

Tree Wire: A semi-insulated wire used in heavily treed areas to protect lines from momentary tree limb contact.

Trim: An operation completed during maintenance programs, during storm situations and new electric line installations performed by qualified workers to cut back the tree line or remove potentially problematic trees that are too close to the electric lines and provide a potential threat to the reliability of the electric line.

Trip (Dump): A disconnection of an electric circuit. When a line "trips out", the circuit breaker has opened and the line is out of service. The action of breaking a circuit usually refers to an automatic rather than a manual action.

Two Phase: An electric utility owned line that carries electrical loads capable of meeting the electrical requirements of residential customers, small commercial customers, and streetlights which consists of two primary conductors and one neutral conductor. **(PAGE 1-15).**

Underground (URD): Electrical facility installed below the surface of the earth.

Vault: An enclosure, above or below ground, which personnel may enter and which is used for the purpose of installing, operating, or maintaining equipment or cable.

Volt: A unit of electrical pressure. It measures the force or push of electricity. Volts represent pressure, correspondent to the pressure of water in a pipe.

Voltage: A measure of electrical "pressure".

Watt: A measure of electrical power.

UTILITY REFERENCE GUIDE

Utility Pole Reference Data - Minimum Pole Setting Depths

Per Central Maine Power Standards, 1987

(Exceptions may apply)

Pole Length	Soil	Soil / Ledge Combo	Ledge
25'	5'-0"	4'-6"	3'-6"
30'	5'-6"	4'-6"	3'-6"
35'	6'-0"	5'-0"	4'-0"
40'	6'-0"	5'-0"	4'-0"
45'	6'-6"	5'-6"	4'-6"
50'	7'-0"	6'-0"	4'-6"
55'	7'-6"	6'-0"	5'-0"
60'	8'-0"	7'-0"	5'-6"
70'	9'-0"	7'-6"	6'-0"



HINT: Commonly, the depth of an existing utility pole can be determined by subtracting the distance between the pole brand (stamp) and the existing top of grade elevation from ten feet. Typically on distribution poles, the pole brands are placed ten feet from the butt end of the pole.

Also, the pole band indicates the height and class of pole. For example, 40/4 would indicate a 40 foot pole, class 4.

UTILITY REFERENCE GUIDE

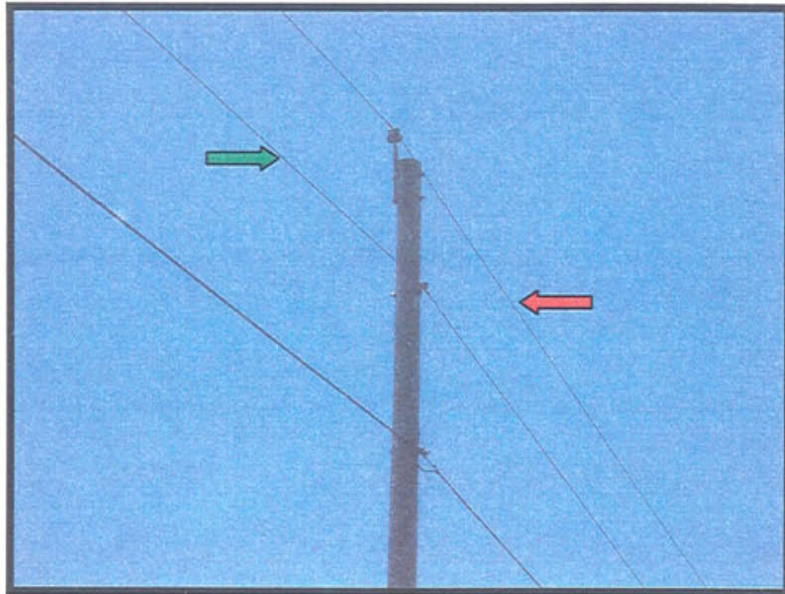
Utility Pole Reference Data -Utility Pole Dimensional Data

Class	H-4	H-3	H-2	H-1	1	2	3	4	5	6	7	9	10
Minimum Circumference at Top (inches)	35	33	31	29	27	25	23	21	19	17	15	15	12
	Length of Pole (ft.)		Minimum Circumference at 6 feet from butt (inches)										
Southern Pine	20	—	—	—	31.0	29.0	27.0	25.0	23.0	21.0	19.5	17.5	14.0
	25	—	—	—	33.5	31.5	29.5	27.5	25.5	23.0	21.5	19.5	15.0
	30	—	—	—	36.5	34.0	32.0	29.5	27.5	25.0	23.5	20.5	—
	35	—	—	43.5	41.5	39.0	36.5	34.0	31.5	29.0	27.0	25.0	—
	40	51.0	48.5	46.0	43.5	41.0	38.5	36.0	33.5	31.0	28.5	—	—
	45	53.5	51.0	48.5	45.5	43.0	40.5	37.5	35.0	32.5	30.0	—	—
	50	55.5	53.0	50.5	47.5	45.0	42.0	39.0	36.5	34.0	—	—	—
	55	58.0	55.0	52.0	49.5	46.5	43.5	40.5	38.0	—	—	—	—
	60	59.5	57.0	54.0	51.0	48.0	45.0	42.0	39.0	—	—	—	—
	65	61.5	58.5	55.5	52.5	49.5	46.5	43.5	40.5	—	—	—	—
	70	63.5	60.5	57.0	54.0	51.0	48.0	45.0	41.5	—	—	—	—
	75	65.0	62.0	59.0	55.5	52.5	49.0	46.0	—	—	—	—	—
	80	66.5	63.5	60.0	57.0	54.0	50.5	47.0	—	—	—	—	—
	85	68.0	65.0	61.5	58.5	55.0	51.5	48.0	—	—	—	—	—
	90	69.5	66.5	63.0	59.5	56.0	53.0	49.0	—	—	—	—	—
	95	71.0	67.5	64.5	61.0	57.0	54.0	—	—	—	—	—	—
	100	72.5	69.0	65.5	62.0	58.5	55.0	—	—	—	—	—	—
	105	74.0	70.5	67.0	63.0	59.5	56.0	—	—	—	—	—	—
	110	75.0	71.5	68.0	64.5	60.5	57.0	—	—	—	—	—	—
	115	76.5	72.5	69.0	65.5	61.5	58.0	—	—	—	—	—	—
	120	77.5	74.0	70.0	66.5	62.5	59.0	—	—	—	—	—	—
	125	78.5	75.0	71.0	67.5	63.5	59.5	—	—	—	—	—	—
Jack Pine, Red Pine, Lodgepole Pine	20	—	—	—	32.5	30.5	28.5	26.5	24.5	22.5	21.0	18.0	14.5
	25	—	—	—	35.0	33.5	31.0	29.0	27.0	25.0	23.0	20.0	15.5
	30	—	—	—	39.0	36.5	34.0	31.5	29.0	27.0	25.0	21.0	—
	35	—	—	—	41.5	38.5	36.0	33.5	31.0	28.5	26.5	—	—
	40	—	—	—	44.0	41.0	38.0	35.5	33.0	30.5	—	—	—
	45	—	—	—	46.0	43.0	40.0	37.0	34.5	32.0	—	—	—
	50	—	—	—	48.0	45.0	42.0	39.0	36.0	—	—	—	—
	55	—	—	—	49.5	46.5	43.5	40.5	—	—	—	—	—
	60	—	—	—	51.5	48.0	45.0	42.0	—	—	—	—	—
	65	—	—	—	53.0	49.5	46.0	43.0	—	—	—	—	—
	70	—	—	—	54.5	51.0	47.5	44.5	—	—	—	—	—
	75	—	—	—	56.0	52.5	49.0	—	—	—	—	—	—
	80	—	—	—	57.5	54.0	50.5	—	—	—	—	—	—
	85	—	—	—	58.5	55.0	51.5	—	—	—	—	—	—
	90	—	—	—	60.0	56.5	52.5	—	—	—	—	—	—
Ponderosa Pine & Western Red Cedar*	20	—	—	—	33.5	31.5	29.5	27.0	25.0	23.0	21.5	18.5	15.0
	25	—	—	—	37.0	34.5	32.5	30.0	28.0	25.5	24.0	20.5	16.5
	30	—	—	—	40.0	37.5	35.0	32.5	30.0	28.0	26.0	22.0	—
	35	—	—	48.0	45.5	42.5	40.0	37.5	34.5	32.0	30.0	27.5	—
	40	56.5	53.5	51.0	48.0	45.0	42.5	39.5	36.5	34.0	31.5	—	—
	45	59.0	56.0	53.5	50.5	47.5	44.5	41.5	38.5	36.0	33.0	—	—
	50	61.5	58.5	55.5	52.5	49.5	46.5	43.5	40.0	37.5	—	—	—
	55	64.0	61.0	57.5	54.5	51.5	48.5	45.0	42.0	—	—	—	—
	60	66.0	63.0	59.5	56.5	53.5	50.0	46.5	43.5	—	—	—	—
	65	68.0	65.0	61.5	58.5	55.0	51.5	48.0	45.0	—	—	—	—
	70	70.0	67.0	63.5	60.0	56.5	53.0	49.5	46.0	—	—	—	—
	75	72.0	68.5	65.0	61.5	58.0	54.5	51.0	—	—	—	—	—
	80	74.0	70.5	67.0	63.0	59.5	56.0	52.0	—	—	—	—	—
	85	75.5	72.0	68.5	64.5	61.0	57.0	53.5	—	—	—	—	—
	90	77.0	73.5	70.0	66.0	62.5	58.5	54.5	—	—	—	—	—
	95	79.0	75.0	71.5	67.5	63.5	59.5	—	—	—	—	—	—
	100	80.5	76.5	72.5	69.0	65.0	61.0	—	—	—	—	—	—
	105	82.0	78.0	74.0	70.0	66.0	62.0	—	—	—	—	—	—
	110	83.5	79.5	75.5	71.5	67.5	63.0	—	—	—	—	—	—
	115	84.5	80.5	76.5	72.5	68.5	64.0	—	—	—	—	—	—
	120	86.0	82.0	78.0	74.0	69.5	65.0	—	—	—	—	—	—
	125	87.5	83.0	79.0	75.0	70.5	66.0	—	—	—	—	—	—

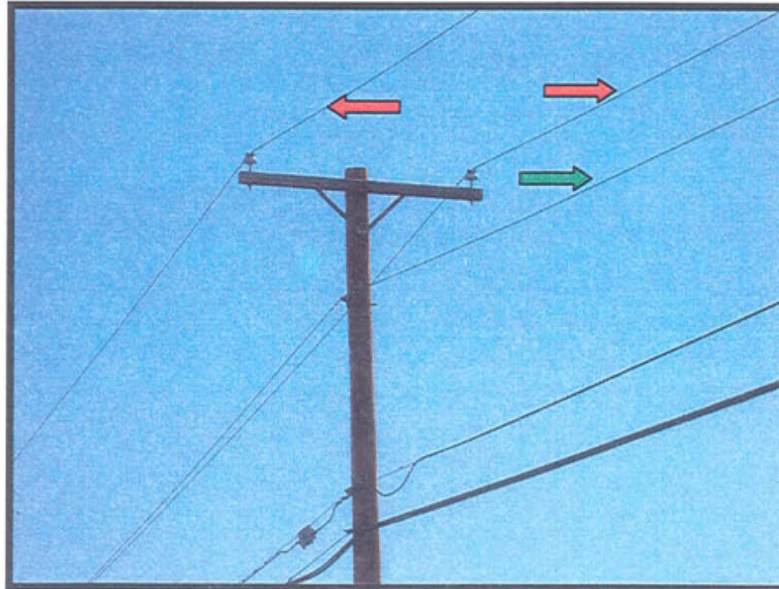
*Dimensions of H Classes are applicable for western red cedar only.
ANSI 05.1

UTILITY REFERENCE GUIDE

Various Distribution Pole Top Configurations



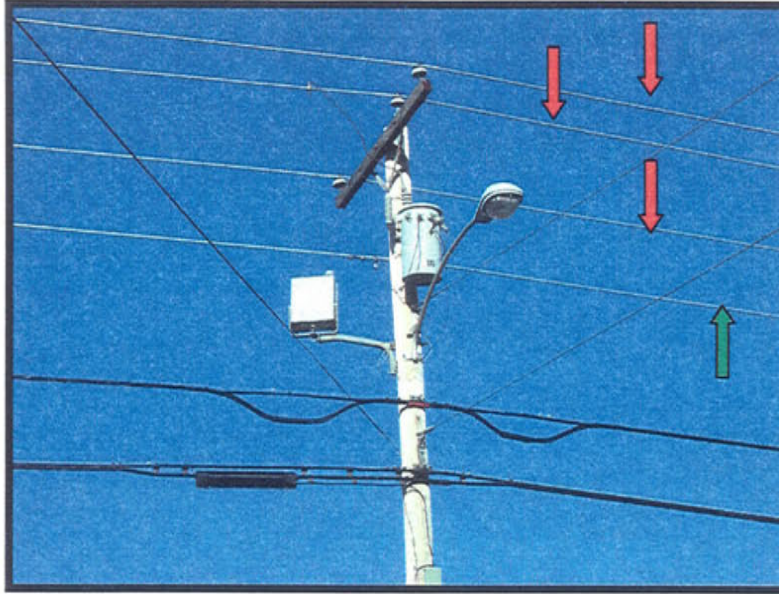
Single Phase Pole Top Construction
Primary Conductor - **Neutral Conductor**



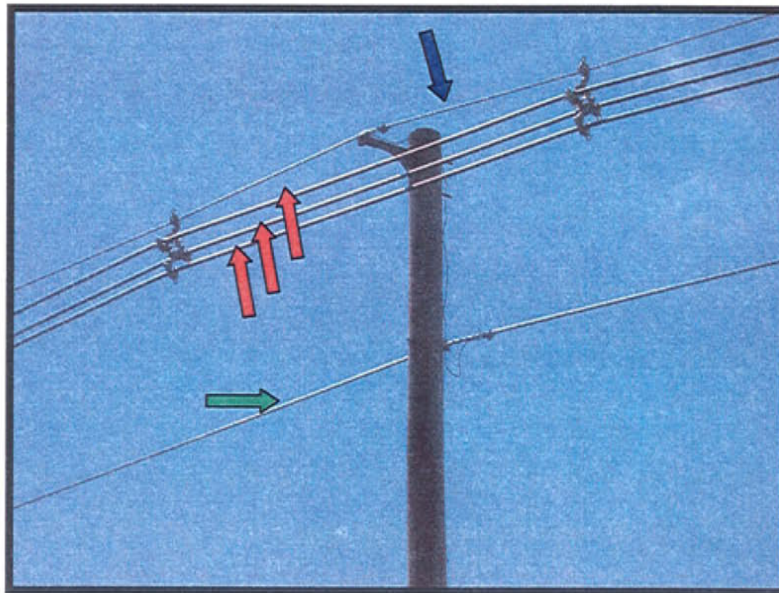
Two Phase Pole Top Construction
Primary Conductor - **Neutral Conductor**

UTILITY REFERENCE GUIDE

Various Distribution Pole Top Configurations

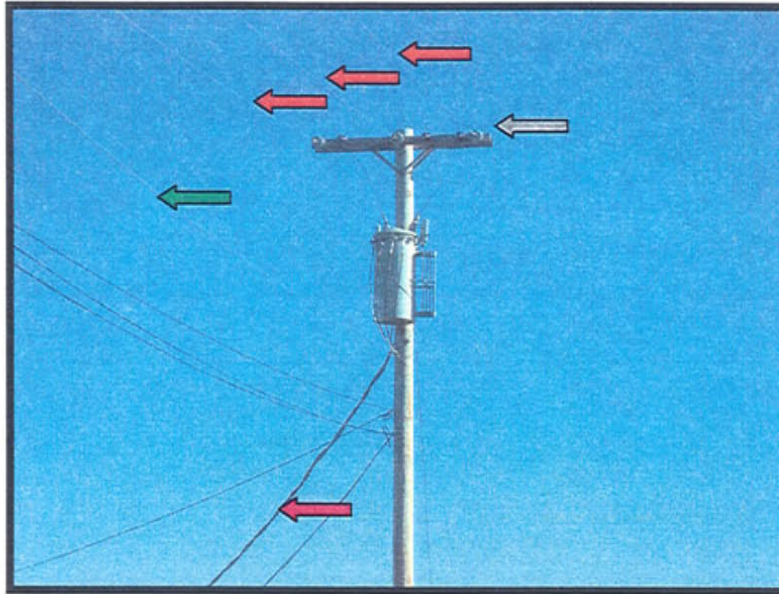


Three Phase Pole Top Construction (Standard)
Primary Conductor - **Neutral Conductor**

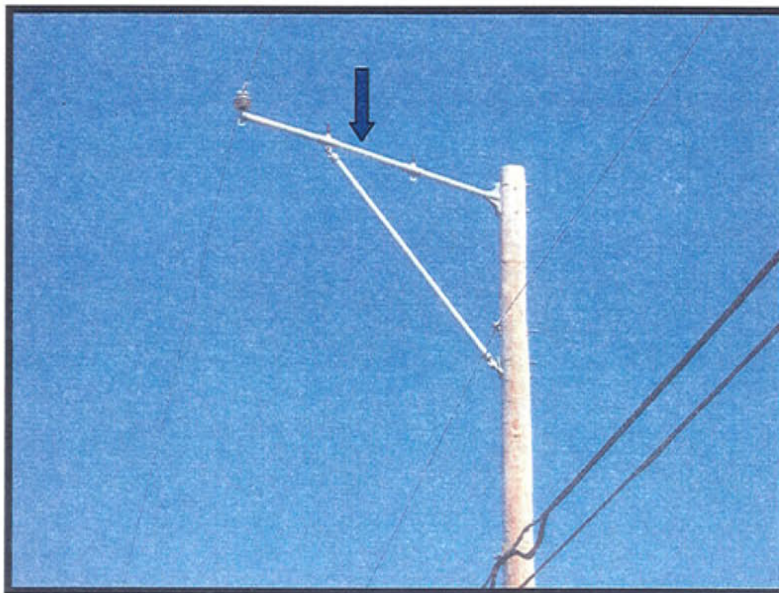


Three Phase Pole Top Construction (Hendrix)
Primary Conductor - **Neutral Conductor** – **Support Wire**

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Common Aerial Distribution Equipment



Pole Top Conductors
Primary Conductors - Neutral Conductor - Service Drop (Secondaries)

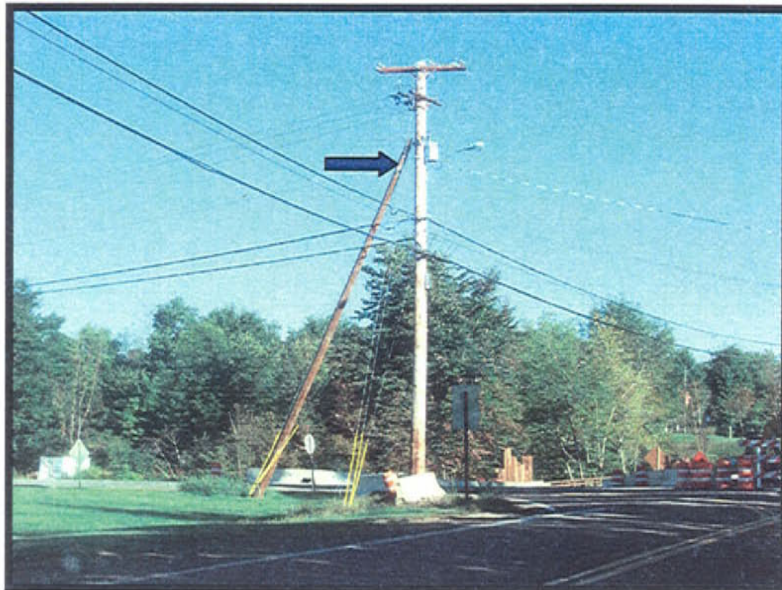


Alley Arm (Single Phase Shown)

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Common Aerial Distribution Equipment

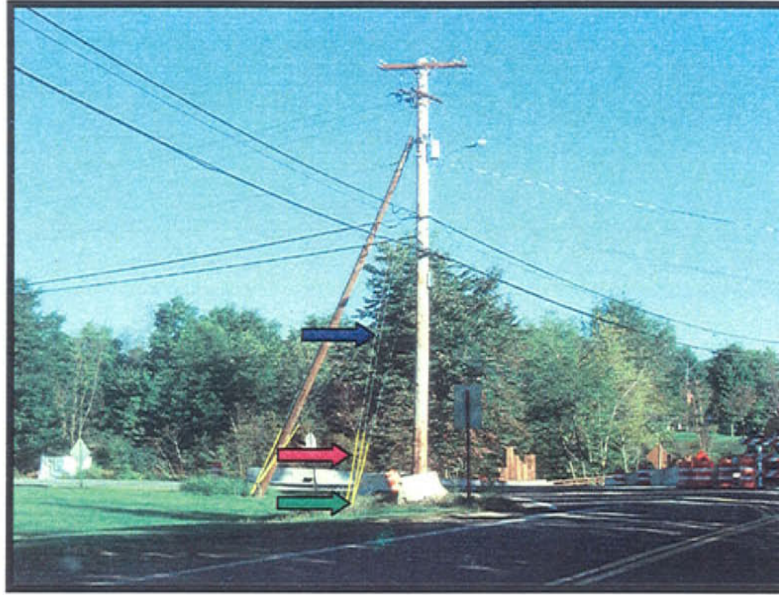


Riser Pole (Three Phase Shown)



Push Brace (or Push Pole)

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Common Aerial Distribution Equipment

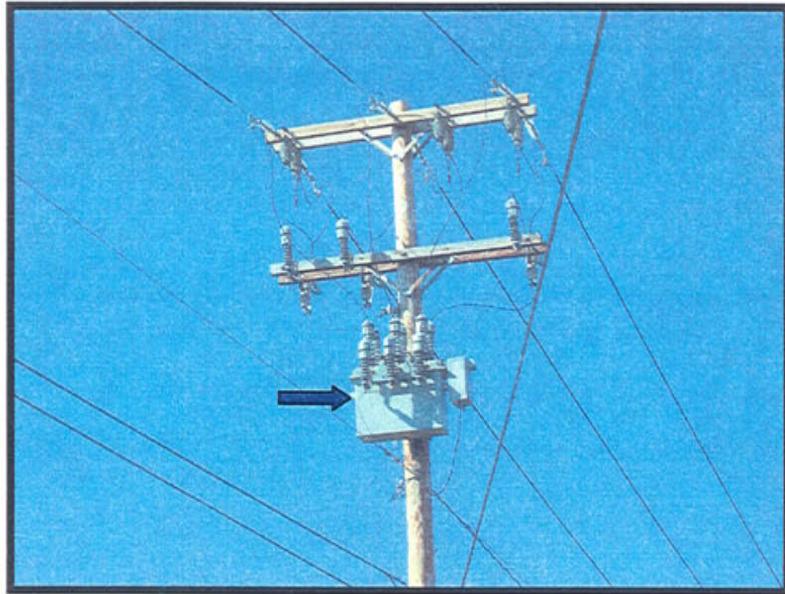


Pole Guy
Guy Wire - **Guy Guard** - **Anchor**

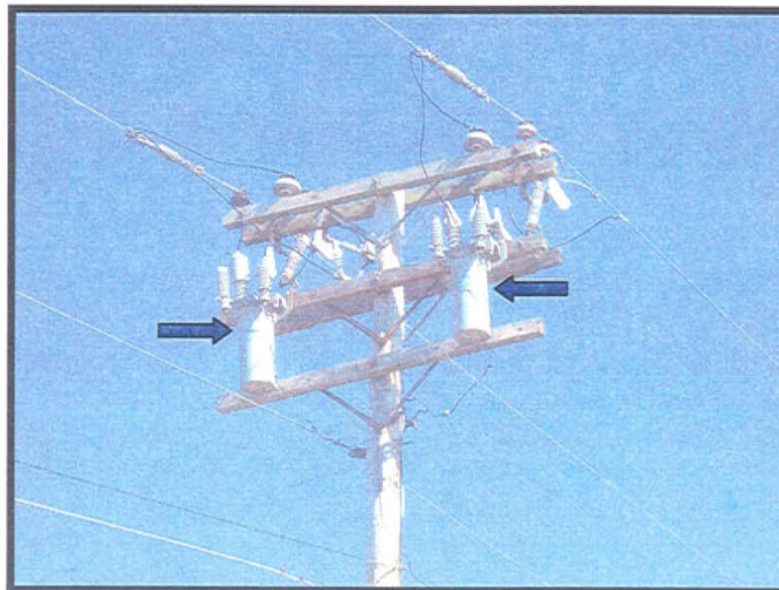


Capacitor

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Common Aerial Distribution Equipment



Reclosure (Three Phase)

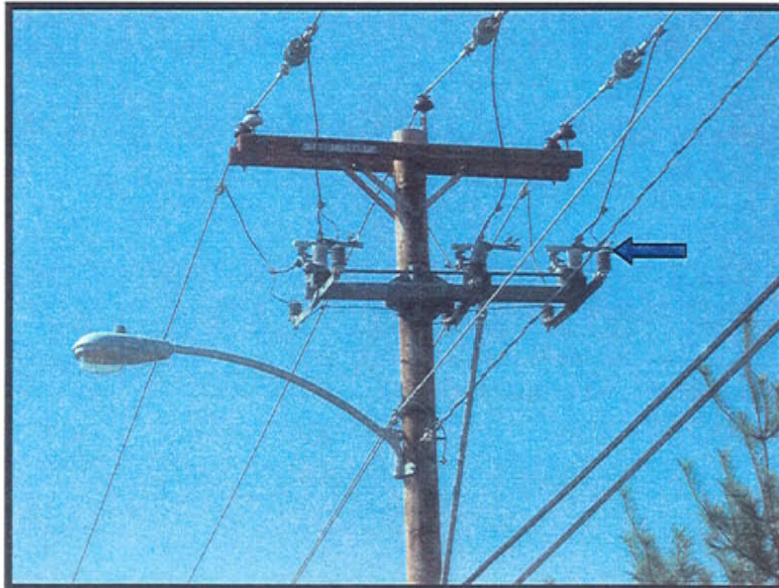


Reclosure (Single Phase)

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Common Aerial Distribution Equipment



Regulator

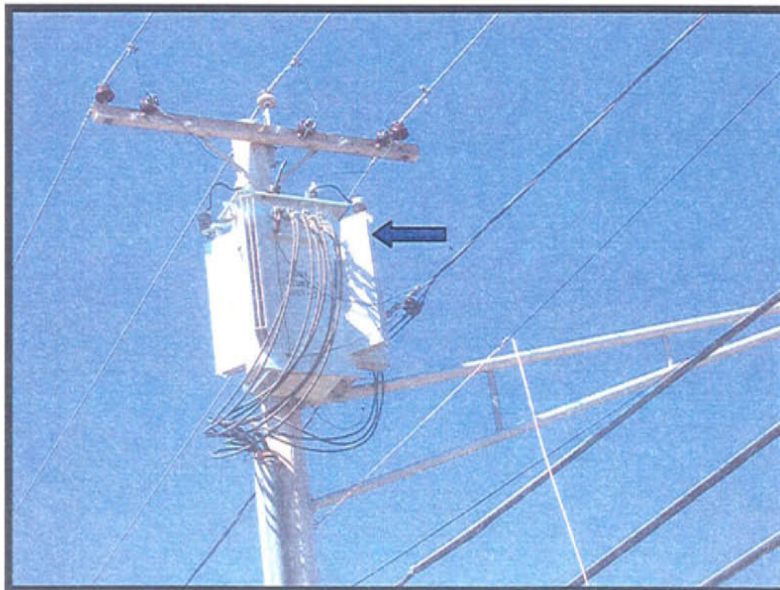


Switch

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Common Aerial Distribution Equipment



Distribution Transformer (Single Phase Unit)



Distribution Transformer (Three Phase Unit)

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Common Aerial Distribution Equipment

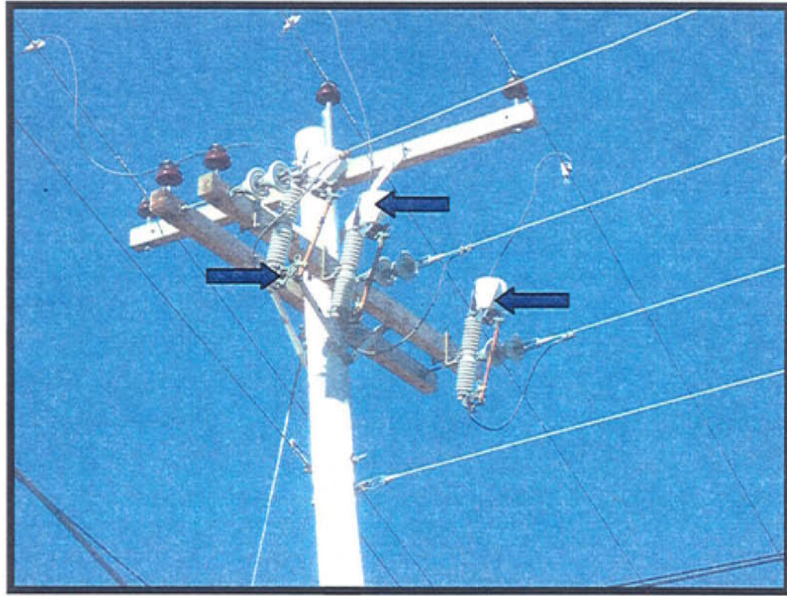


Distribution Transformers (Three Phase Bank)



Fixture

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Common Aerial Distribution Equipment



Fused Cutouts

UTILITY REFERENCE GUIDE
Common Underground Distribution Equipment

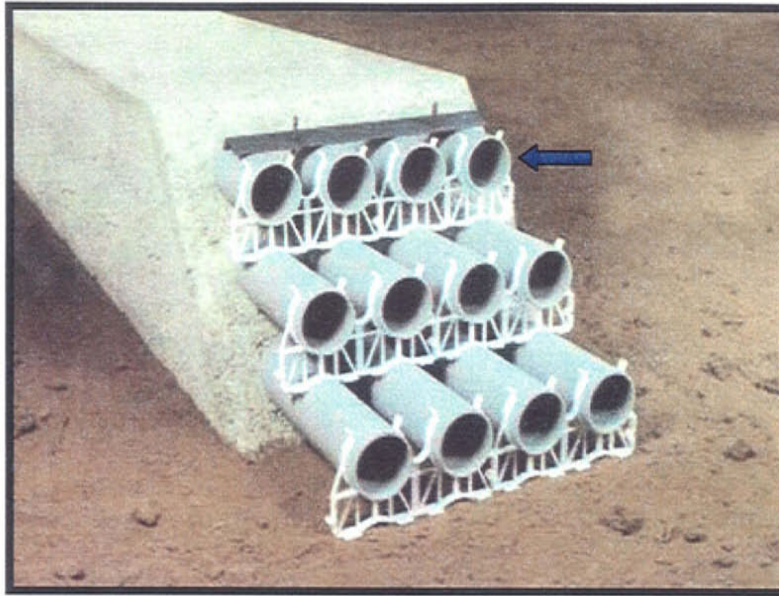


Padmount Transformer



Meter Enclosure for Underground Services

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Common Underground Distribution Equipment



Duct Bank



Handhole

UTILITY REFERENCE GUIDE

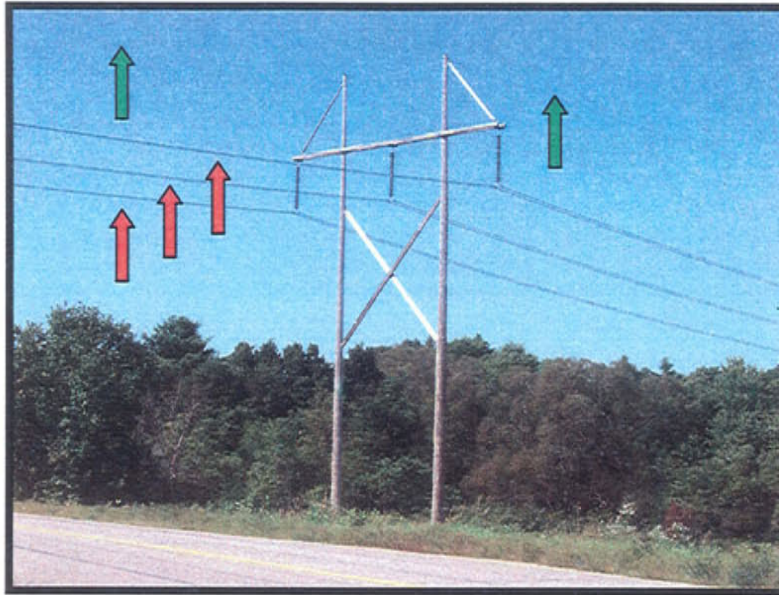
Common Underground Distribution Equipment



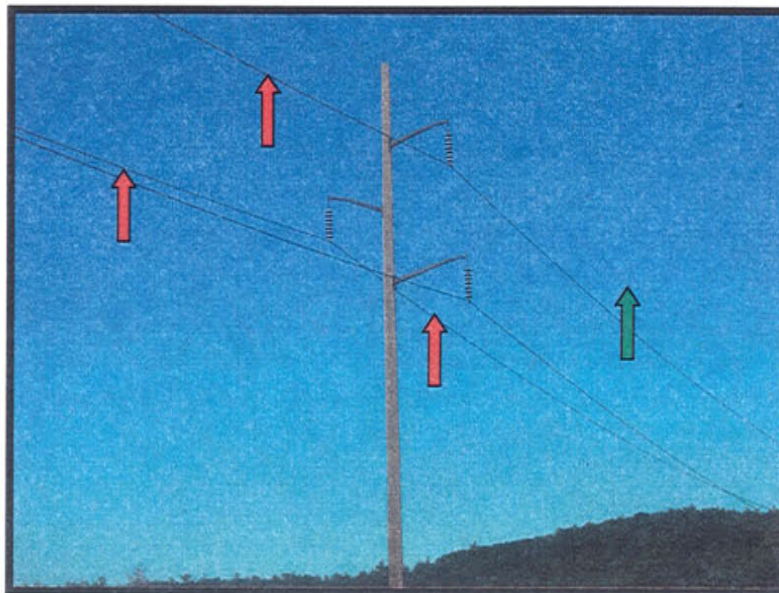
Manhole

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Various Transmission Pole Top Configurations



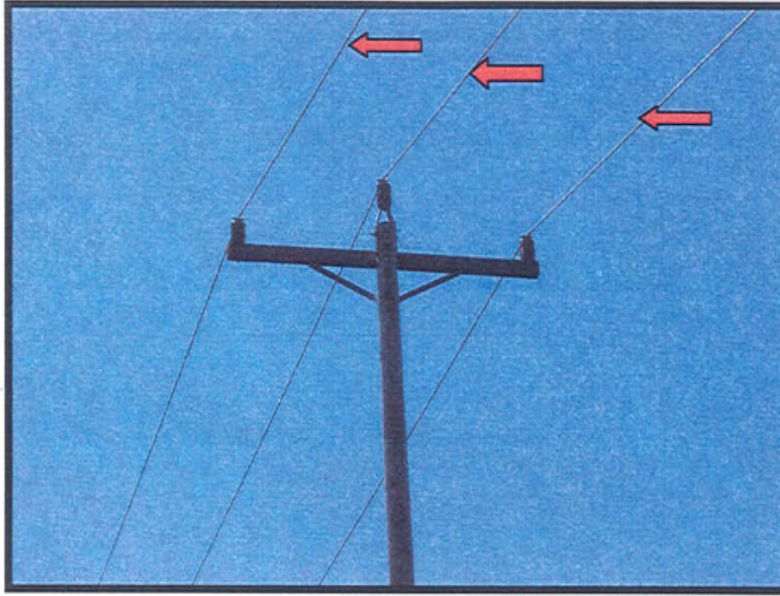
345kV Transmission "H" Structure
Transmission Conductors - **Static Lines**



115kV Transmission Structure
Transmission Conductors - **Static Lines**

UTILITY REFERENCE GUIDE

Various Transmission Pole Top Configurations



34kV Transmission Structure
Transmission Conductors